# Basic Inventory Class

# Overview

- Introduction
  - Planning
  - Data Sources
  - Quality Control and Quality Assurance
- Point
- Area
- Mobile
  - Nonroad
  - Onroad

# What Is An Emission Inventory?

- Current, comprehensive listing, by source, of the air pollutant emissions
- Specific geographic area
- Specific time period

# Types of Sources

- Point sources
- Area sources
- Mobile
  - onroad mobile sources
  - nonroad mobile sources
- Biogenic Sources

# What is a Point Source?

- Individual stationary sources of emissions that release pollutants to the atmosphere.
- Quantities above emission threshold for criteria air pollutants; no thresholds for HAPs
- Point source thresholds vary according to type of pollutant and nonattainment area classification for criteria pollutants.

# What is a Area Source?

- Individual emissions do not qualify as point sources.
- Represents numerous facilities or activities with small amounts of a given pollutant
- Usually do not use same method as point source
- Estimate area source emissions by
  - Emission factors
  - Collecting data

# What is a Mobile Source?

- Source is Mobile and Portable
- Source is Generally Internal Combustion Powered
- Licensed or Certified for Highway Use
  - Automobiles, Trucks, Buses, Motorcycles
- Not Licensed or Certified for Highway Use
  - Planes, Trains, Boats, Farm Equipment, Lawn & Garden Equipment, Construction Equipment

# What Pollutants Do I Inventory?

- Ozone
  - VOC, NOx, CO
- PM
  - Direct PM, NOx, SO2, VOC
- Toxics
  - HAPs
- Acid Rain
  - NOx, SO2
- Visibility
  - Everything

# What Are Criteria Pollutants?

- Ozone ($O_3$)
  - Precursors - VOC, $NO_X$, CO
- Carbon monoxide (CO)
- Nitrogen oxides ($NO_X$)
- Sulfur Dioxide ($SO_2$)
- Particulate Matter ($PM_{10}$ and $PM_{2.5}$)
  - Precursors - VOC, $NO_X$, $SO_2$, PM, $NH_3$
- Lead (Pb)

# General Steps in Inventory Development

- Planning
- Data Collection
- Calculations
- Consolidation
- Documentation

***Quality Assurance in Every Step!***

# What Does An Inventory Contain?

- Tabular summary of emission estimates by source category
- Background information
- Geographic area
- Time interval
- Population, employment, economic data

# What Does An Inventory Contain?
**(Continued)**

- Narrative for each source category
  - Procedures used to collect data
  - Sources of data
  - Copies of questionnaires and results
  - Citations for all emission factors
  - Identification of methods used in calculations
  - Documentation of assumptions
  - Sources not included
  - List of references

# What Data Elements Are Required in the Inventory?

- The term data element refers to any piece of information used in the inventory compilation process.

# What Data Elements Are Required in the Inventory?

- Source Identification (ID and Name)
- Source Location (Address Geographic Coordinates)
- Source Description (Stack Parameters, Capacity)
- Process Description (SCC)
- Activity (Throughput and Temporal Data)
- Controls (Equipment Type and Efficiency)
- Emissions (Amount, Methods, Emission Factors)

# How Are the Results of an Emission Inventory Reported to EPA?

- Report must meet the format and content requirements specified by the regulation or the agency requiring the inventory
- Each EPA Regional Office will determine what information must be submitted as hard copy documentation.
- You must submit your data to EPA in an electronic form

# Electronic Data Transfer

- NET Input Format (Preferred Method)
- AIRS/AFS (Phased out in September 2000)
- EIIP EDI X12
- Direct Source Reporting

# What Are Emission Projections?

- Needed to determine if a given area will achieve or exceed regulatory requirements in future years, and to plan compliance strategies
- Two types of emission projections
  - Baseline emission projections
  - Control strategy emissions projections

# What Are Baseline Emissions Projections?

- Expected growth in an area
- Existing air pollution control regulations in effect at the time
- Promulgated regulations **expected to take effect at future intervals**

# What Are Control Strategy Emission Projections?

- Estimates of future year emissions to include the expected impact of **modified or additional** control regulations

- Reflects all of the growth and control scenarios not just future (baseline)

# Planning for Emission Inventory Preparation

# Why is Planning Important?

- Emission inventories are the foundation of many decision
- Mistakes early in the process interject errors in downstream calculations
- Redoing work is costly and embarrassing
- Unrealistic regulations may result from errors

# Why is Planning Important?

- Facilitate the process
- Every inventory requires extensive advanced planning
- Inventory Preparation Plan (IPP)
  - Identify required staffing levels and resources
  - Specify methods and procedures to be used by each member

# Inventory Planning

- Identify pollutants
- Identify source categories
- Define inventory area
- Define time interval
- Identify control strategies in effect

# Inventory Planning (Continued)

- Define all procedures that will be used to estimate emissions
  - data collection
  - data analysis
  - data formatting and handling
  - reporting/documentation

# Inventory Planning (Continued)

- Define the QA/QC procedures
- Select inventory data management and reporting system
- Establish resource requirements and schedule
- Define intra-agency communication

# What do Attainment and Nonattainment Areas Mean for Criteria Pollutants?

- Compliance status with respect to the NAAQS
- Attainment
  - Air quality as good or better than required by the NAAQS
- Nonattainment
  - Air quality has not reached level required by NAAQS

# What are the Main Approaches to Inventory Development?

- Two main approaches
  - Top-down approach
  - Bottom-up approach

# What are the Characteristics of a Top-Down Approach?

- Typically used to inventory area sources
- Requires minimum resources
- Used when:
  - Local data are not available
  - The cost to gather local information is prohibitive
  - The end use of the data does not justify the cost
- Emission factors/national estimates used to estimate emission in state or county based on surrogate parameter
- Loss of accuracy

# What are the Characteristics of a Bottom-Down Approach?

- Typically used for point sources
- Requires more resources to collect site-specific information
- Results in more accurate estimates than a top-down approach

# How Do I Choose Emission Estimation Methods?

- Choice of methods depends on:
  - HAP and source category priorities
  - intended use of the inventory (DQOs)
  - resources
  - availability of data
  - compromise between method accuracy and cost to implement

# Estimation Methods

- Point Source Methods
  - CEM
  - source tests
  - material balance
  - emission factor x activity factors
  - fuel analysis
  - emission models
  - engineering judgment

# Estimation Methods

**(Continued)**

- Area Source Methods
  - surveys and questionnaires
  - material balance
  - emission factor x activity factors
  - emission models
- Mobile
  - approved models

# Sources of Data for Emission Inventory Preparation

# What Data Sources Should I Use?

- Inventory guidance
- Existing emissions data
- Emission factor resources
- Models
- Source characterization documents
- Activity data references

# Where Do I Find Existing Criteria Emission Data

- The National Emission Trends (NET) database
  - ftp://www.epa.gov/pub/EmisInventory/net_96/
  - ftp://ftp.epa.gov/pub/EmisInventory/net_96/
- AIRS Data Web Page
  - http://www.epa.gov/airsdata/net.htm
- AE Plus CD
  - http://www.epa.gov/airs/aexec.html
- Extrapolation of emissions from one geographic region to another

# Where Do I Find Emission Factor Information?

- EPA References
  - EIIP
  - AP-42 and L&Es
  - FIRE
  - CHIEF Website
  - AIR CHIEF CD-ROM
  - NTI, 112k and 112c6 inventory documentation

# Where Do I Find Emission Factor Information?

- Miscellaneous private sector resources
- Emission factor reports published by other states
- Emission factors gathered by regional groups such as Great Lakes Commission (RAPIDS)
- Source test data for compliance purposes
- Professional societies

# Handbooks for Criteria Inventory Development

- Beginner's Guides
  - Covers stationary sources (point and area)
  - Describes "top-down" and "bottom-up" inventory preparation.
- Organization
  - Planning and compiling
  - Identify sources and pollutant concern
  - Locate activity data
  - Locate emission factors
  - Emission Estimation

# Where Do I Find Information on Emission Estimation Models?

- CHIEF Website has several emission estimation models for download free-of-charge.
  - TANKS
  - LAEEM
  - WATERS8 and CHEMDAT8
  - MECH
  - PM Calculator

# QA/QC Procedures for Emission Inventory Preparation

# Why Is a QA Program Important?

- Quality Control (QC)
  - Technical reviews
  - Accuracy checks
  - Use approved standardized procedures for emissions calculations
- Quality Assurance (QA)
  - External review and audit procedures by a third party

# Why Is Proper Documentation Important?

- Ensure that the final written compilation of the data accurately reflects the inventory effort.
- Support QA/QC assessments of the inventory
- Ensure reproducibility of the inventory estimates
- Enable an inventory user or reviewer to assess the quality of the emission estimates and identify the data references
- Foundation for future inventories

# IPPs and QAPs

- Every inventory should have an Inventory Preparation Plan (IPP)
- Every IPP should contain a Quality Assurance Plan (QAP)
- See EIIP Volumes I, III, and VI

# IPPs and QAPs

Accurate and complete inventory documentation necessary to:

- support QA/QC assessments of inventory
- determine quality of emission estimates
- identify data references
- allow reproducibility of estimates
- ensure inventory will be starting point for future inventories

# What Records Must Be Kept?

- Documentation of all data collection and emission estimation activities
  - methods
  - assumptions
  - raw data
  - calculations (manual and electronic)
- Compilation of the inventory into a final written report

# What Documentation Procedures Must Be Followed?

- Each project member should be assigned a numbered, project-specific, notebook for recording all calculations and assumptions
- All entries should be initialed and dated
- Calculations and documentation should be done in ink not pencil
- Errors should be corrected by drawing a single line through original and writing the correct value nearby. Corrections should be initialed and dated.

# How Do I Track Data Entry?

- Established in the inventory preparation plan (IPP)

- Important record the **names** of persons responsible and the **dates** of **each** data manipulation activity

# How Do I Check Accuracy of Data Inputs and Manipulations?

- Established in the inventory preparation plan
- Check the transcription of data during the inventory preparation
  - Transcription of data from raw data sheets into electronic spreadsheets or manual calculations
  - Transcription of data results into summary tables

# How Do I Document QA/QC Procedures?

- QA/QC must be documented and reported
- Report should include
  - Procedures used
  - Technical approach used to implement QA plan
  - Dates of each audit, and the names of the reviewers
  - Results of QA activities, including problems found, correction actions and recommendations
  - Discussion of the inventory quality

# What Are DQIs?

- Data quality indicators - qualitative and quantitative descriptors used to interpret degree of acceptability or utility of the data
- Principal DQIs
  - Accuracy
  - Comparability
  - Completeness
  - Representativeness

# What Are DQOs?

- Data Quality Objectives - Qualitative and quantitative statements to identify the level of uncertainty that a decision-maker is willing to accept

- Identified as part of the inventory planning process

# What QA/QC Procedures Should I Follow?

- QC of calculations
- Data verification procedures
- Completeness checks
- Consistency checks
- Double counting
- Reasonableness
- Data entry errors

# What Quality Control Procedures Should I Follow?

- Best implemented through standardized checklists
- Use checklist to monitor
  - Data collection
  - Data calculations
  - Evaluation of data reasonableness
  - Evaluation of data completeness
  - Data coding and recording
  - Data tracking

# Primary QA/QC Methods

- Reality checks
- Peer review
- Sample calculations
- Computerized checks

# Primary QA/QC Methods

- Sensitivity analysis
- Statistical checks
- Independent audits
- Emission estimation validation

# What Is a Reality Check?

- Most commonly used
  - Is this number reasonable? Does it make sense?
- You should never use the reality check as the sole criterion of quality

# What Is Peer Review and How Does It Benefit the Inventory Process?

- An independent review of calculations, assumptions, and/or documentation by person with  a moderate to high level of technical experience

# What Does Replication of Calculations Mean?

- Most reliable way to detect computational errors
- General rule, a minimum of 10% of calculations is checked depending on:
  - Complexity of calculations
  - Inventory DQOs
  - Rate of errors encountered

# What Are Computerized Checks?

- Automated data checks can be built-in functions of databases, models, or spreadsheets or can be designed as stand-along programs
- Automate to
  - Check for data format errors
  - Conduct range checks to ensure data falls within specified min/max
  - Provide look-up tables to define permissible entries

# What Are Statistical Checks and How Are They Used?

- Descriptive statistics
- Statistical procedures to identify outliers
- Statistical tests

# How Will Quality Assurance Audits Benefit the Emission Inventory Process?

- Managerial tools
  - Identify staffing issues
  - Evaluate the effectiveness of the technical and quality procedures
  - Provide confidence in the accuracy and completeness of the emission data
  - Determine if DQOs are being met
  - Identify the need for additional QC measures
  - Streamline the costs associated with the inventory development

# What Types of Errors Are Typically Found?

- Missing facilities
- Duplicate facilities
- Closed facilities
- Improper facility locations
- Missing operating or technical data
- Erroneous technical data
- Inconsistent point and area source size designation
- Double counting
- Errors in calculations
- Data entry and transposition errors; data coding errors

# How Do I Identify and Fill Data Gaps?

- Perform additional searches of databases to identify appropriate surrogate data
- Use the NET/NTI databases to spatially allocate emissions
- Extrapolate emissions from other geographic areas
- Project emissions data from past inventories within the same geographic area

# What Is Double Counting and How Do I Avoid It?

- Double counting occurs when the emissions from one source are included twice in the same inventory

- Causes
  - Overlap between point and area sources
  - overlap between area source categories

# How Do I Adjust Area Source Inventories for Point Source Contributions?

Area Source Activity =

Total Activity of Source Category -
Sum of Point Source Activity

# Point Sources

# What Sources Should Be Included?

- Identify the pollutants to be inventoried before relevant source categories can be identified
- Identify the source categories to be included in the emissions inventory
- Identify geographic area to include

# How Are Point Sources Categorized?

Some Major Categories:

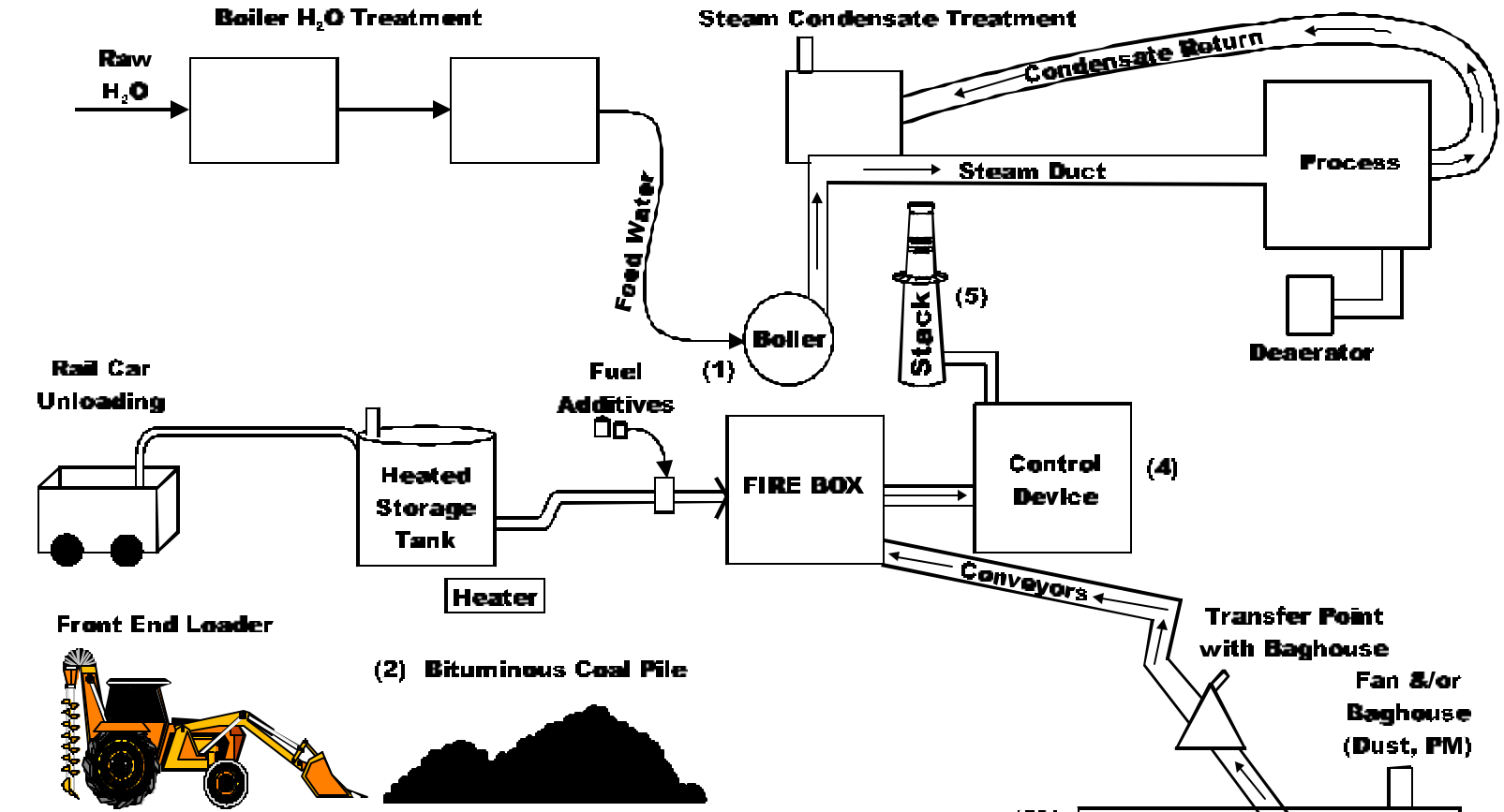
- Utility Fuel Combustion
- Industrial Fuel Combustion
- Other Fuel Combustion
- Chemical & Allied Product Manufacturing
- Metals Processing
- Petroleum & Related Industries
- Other Industries
- Solvent Utilization
- Storage & Transport
- Waste Disposal & Recycling

# How Should I Research Possible Sources of Criteria Pollutants?

- Research all of the documents and tools made available by EPA
- Eliminate any sources that are not found within the inventory area
- Prioritize the list of remaining categories
- Consider time and budget constraints
- Eliminate any categories for which no emission factors or acceptable methods have been developed
- Document your decisions for the benefit of future preparers

# At What Level of Detail Are Point Source Inventories Compiled?

- Plant level - data for all operations at a plant
- Unit level - data for each emission generating unit (e.g., boiler) at a plant
- Process level - data for each emission generating process at a unit (e.g., burning coal at a boiler)




**Coal Burning Industrial Cyclone Boiler**

# How do I Identify Specific Point Sources in the Inventory Area?

- Compile a list of facilities
  - Name and address, size and SIC
- Various Sources of information useful for identifying point sources
  - NET/NTI
  - S/L/T commerce directories
  - Existing state inventories
  - TRI data
  - MACT data
  - Standard & Poor's
  - Thomas Register
  - Dun and Bradstreet Million Dollar Directory

# Where Do I Find Applicable Activity Parameters? (Point)

- Surveys and questionnaires
- Direct plant inspections
- Permit applications or compliance files
- State and local industrial directories
- State Departments of Commerce and Labor statistics
- National and state directories of manufacturers
- Data compiled by private research and development companies, e.g. SRI
- Trade and professional associations

# What Methods Are Used to Collect Data for Point Sources

- Surveys
  - Identify the facilities to be surveyed
  - Prepare the mailing list
  - Design and assemble the questionnaire
  - Deliver the questionnaire
  - Establish tracking systems to monitor the status of each step in the survey process
  - Prepare data handling procedures
  - Establish systems to respond to questions or concerns of survey recipients

# Survey Elements

- Cover Letter
- Questionnaire Instructions
- Questionnaire Design
  - Open or Closed-Ended Approach
  - Emissions-Based Approach
  - Chemical Use Approach
  - General Approach
  - Industry-Specific Approach
  - Tiered Approach

# What Should Be In the Cover Letter?

- Applicable regulations, if applicable
- Confidentiality provisions, if applicable
- Purpose of questionnaire
- A respectful request for cooperation
- Due date for return of questionnaire
- Contact name and telephone
- Rationale for asking for information
- How data will be used

# What Should Be Included in the Questionnaire Instructions?

- General information that affects the whole questionnaire
- Not all questions, sections, pages may apply to every industry
- Instructions should include requests for specific year, or other appropriate period of time

# Open vs. Closed-Ended

- Open-Ended
  - Does not target specific source types
  - Ask respondent to list any compounds
  - Less time and effort in design
  - Responses may be less detailed
  - Inaccurate or trade names
  - May not report air toxic emissions
- Closed-Ended
  - Provides a limited list of compounds
  - List lists of toxic compounds
  - Requires more design time
  - Quality and detail of data better

# Emission Based vs. Chemical Use

- Emission Based
  - Included in VOC or PM emission inventories
  - Request permitted, allowable, potential, maximum and/or actual emissions
  - May ask for emergency episode emissions, fugitive emissions, and information from excluded criteria emission inventory sources
- Chemical Use
  - Directed towards lists of specific compounds
  - Request process information and Material Safety Data Sheets (MSDS)

# Tiered Approach

- Staggered mail-out approach
- Cover letter and screening study type questionnaire
- Followed by detailed questionnaires to select number
- Phone survey may be used in screening

# Survey Considerations

- Asking the right questions
- Maximizing return rates
- Providing for facility confidentiality of trade secrets
- Outlining questions applicable for particular source categories
- Designing question/answer style and format to decrease confusion or misrepresentation
- Developing a data quality assurance procedure.

# The Return Rate

- Minimize questionnaire length
  - First impression
  - Make forms uncluttered and easy to read
- Staggered mail important for large inventories
- Enough time for respondent not to be overly rushed and short enough that the respondent does not procrastinate.

# Confidentiality

- The simplest
  - Box to be checked to request confidentiality
  - Respondent submits one full questionnaire and one “sanitized”
- Complex
  - Assignment of a survey number to each questionnaire and general information page
  - Agency director would detach the general information page and store in a locked file.

Note: EPA does not want confidential data for our national EIs

# Applicability and Clarity of Questions

- Clear statement from which the respondent can determine whether the questionnaire is applicable

- Questions should be clearly presented, well arranged, and easy to answer

# Clarity of Instructions

- Questionnaire responses must provide both the descriptive information desired and the correct numerical data
- Do not confuse the recipient
- Instructions should be concise
- Units of measurement, method of calculations and conversions, and code number instructions should be put on the questionnaire itself and not explained in the instructions

# Final Considerations

- Check the questionnaires effectiveness
  - Limited pilot mailing followed by site visits
  - Include a few questions at the end of the questionnaire
    - Were the questions clear?
    - How long did it take to complete?
    - Were the questions applicable to your company?
    - Do you receive adequate response from the agency?
    - Was the time allowed sufficient?

# Follow-Up Procedures

- More important than the planning effort
- Quality control of data
- On-site inspections
- Recontacting sources

# What Are the Types of Emissions Estimation Methods?

- Continuous emissions monitor (CEM)
- Source testing
- Material balance
- Emission factors
- Fuel analysis
- Emission estimation models
- Engineering judgment

# How Do I Select a Method When Multiple Methods Are Applicable?

- Consider the issues when analyzing the tradeoffs between cost and accuracy of the resulting estimates
- Depends on Several Issue
  - Availability of quality data needed
  - Practicality of the method for the specific source category
  - Intended end use of the inventory
  - Pollutant and source category priority
  - Time available to prepare the inventory
  - Resources available in terms of staff and funding

# Continuous Emissions Monitors

- Measure and record actual emissions during the time period the monitor is operating and the data produced can be used to estimate emissions for different operating periods.

# Calculation 1

# Source Testing

- Short-term emission measurements typically taken at a stack or vent.
- Raw data used to develop emission factors
- Summarize emissions for each pollutant by expressing them in terms of
  - Mass loading rate
  - Emission factor
  - Flue gas concentration

# Source Testing

- Individual test at facility
- Testing at similar facilities
- Pooled source testing

# Calculation 2

# Material Balance

- Used when
  - Source test data, emission factors, or other developed methods are not available
  - Where accurate measurements can be made of all process parameters
  - Good for processes like solvent degreasing operations, and surface coating operations
  - Should not be used for processes where material reacts to form secondary products or undergoes significant chemical change

# Calculation 3

# Emission Factors

- Allow development of generalized estimates of typical emissions from source categories or individual sources within a category
- Estimates the rate at which a pollutant is released to the atmosphere as a result of some process
- Provide a reasonable estimate of pollutant emissions across an entire source category

# EFIG Sources of Emission Factors

- AP-42
- FIRE
- L&Es
- NTI Documentation
- EIIP
- AIR CHIEF CD-ROM

# Calculation 4

# What Should I Consider in Estimating Effectiveness

- Nature of the rule or regulation
- Nature of the compliance procedures
- Performance of the source in maintaining compliance over time
- Performance of the implementing agency in assuring compliance

# What Is the Basic RE Equation?

$$E_C = A \times EF \times (1 - CE \times RE)$$

where:

| | | |
|---|---|---|
| $E_C$ | = | Emissions after control |
| A | = | Activity |
| EF | = | Emission Factor |
| CE | = | Estimated control efficiency (expressed as a fraction) |
| RE | = | Rule effectiveness (expressed as a fraction) |

# Fuel Analysis

- Used to predict emissions based on the application of conservation laws
- $E = Q_f \times \text{Pollutant in fuel} \times (MW_p/MW_f)$

  where:

  $Q_f$ = throughput of the fuel, mass rate (e.g. lb/hr)

  $MW_p$ = molecular weight of pollutant emitted (lb/lb-mole)

  $MW_f$ = molecular weight of pollutant in fuel (lb/lb-mole)

# Calculation 5

# Emission Estimation Models

- Used when
  - Calculations are very complex
  - Combination of parameters has been identified that affect emissions, but individually, do not provide a direct correlation

# Emission Estimation Models

- TANKS - storage tanks
- LAEEM - landfill
- WATER8 - wastewater
- CHEMDAT8 - wastewater

# Engineering Judgment

- Last resort to be used only if none of the methods described can be used to generate accurate emission estimates

# What Is Temporal Allocation?

- Seasonal , day of week, and hourly differences in the rate of emissions or high activity, or to apportion emission to a particular season
- Adjust emissions estimates to account for temporal differences
  - Activity level
  - Rate of emissions

# Area Sources

# Key Steps in Preparing Area Source Inventory

- Planning
- Gathering information
- Estimating emissions
- Performing QA/QC checks

# Key Steps in Preparing Area Source Inventory

- Data Gathering
  - Existing inventory data
  - Preliminary screening study
  - Emission factors
  - Activity data

# Key Steps in Preparing Area Source Inventory

- Existing inventories
  - State/local/tribe inventories
  - 1996 NTI
  - Criteria NET
  - 112k/112c6 inventories

# Key Steps in Preparing Area Source Inventory

- Conduct Preliminary Screening Study
  - What area source pollutants need more study?
  - What area source categories need more study?
  - What geographic areas emit pollutants from source categories?

# Key Steps in Preparing Area Source Inventory

- Conduct Preliminary Screening Study
  - Determine which pollutants to inventory
  - Identify source categories of pollutants.
  - Determine which source categories to inventory as point vs. area sources in specific geographic areas.

# How Are Area Sources Typically Categorized?

- Fuel Combustion
- Chemical and allied products manufacturing
- Metal processing
- Petroleum and related industries
- Other industrial processes
- Solvent utilization
- Storage and transport
- Waste disposal and transport
- Natural sources (e.g. wind erosion)
- Miscellaneous sources (e.g. unpaved roads and agricultural burning)

# How Are Area Sources Typically Categorized?

- Material storage/distribution
- Cooling towers
- Fires - prescribed burning, forest fires, structural fires, ag burning
- Hospital sterilizers
- Gasoline service stations
- Dry cleaners

# How Do I Identify Area Sources in the Inventory Area?

- Facilities, or activities within facilities whose emissions are below the threshold level of point sources
- Activities which result in emissions below the threshold level of point sources
- Existing Area Source Inventories - S/L/T inventories, 1996 NET, 1996 NTI, 112k/112c6 inventories

# At What Level of Detail Are Area Source Inventories Compiled?

- State
- County level
- Other jurisdictions for which activity surrogates are available

# Where Do I Find Applicable Activity Parameters ?

- Sources of Area Source Activity Data
  - US Dept of Commerce
    - County Business Patterns
    - Census of Population
    - Census of Manufacturers
    - Census of  Agriculture
    - County and City Data Book
    - Current Industrial Reports
    - Census of Retail Trade

# Where Do I Find Applicable Activity Parameters ?

- Sources of Area Source Activity Data
  - Regional planning commissions
  - Agency-sponsored surveys
  - State Depts. of Transportation and State Energy Offices
  - US DOE
    - State Energy Reports
    - Petroleum Marketing Annual
    - Natural Gas Annual

# Where Do I Find Applicable Activity Parameters ?

- Sources of Area Source Activity Data
  - State Departments Of Labor
  - State Agriculture Offices and USDA
  - State Solid Waste Management agencies
  - Fire marshals
  - Port Authority
  - State Health Departments
  - Miscellaneous statistical government & trade publications

# Where Do I Find Applicable Area Source Emission Factors ?

- EIIP
- AP-42
- L&Es
- FIRE
- NTI area source documentation
- AIR CHIEF CD-ROM

# What Methods Are Used to Collect Data for Area Sources?

- Surveys
- Examination of Local, State and Federal documents and databases
- Examination of trade association reports, journals, and databases

# What Emissions Estimation Methods Should I Use?

- Applying point source methods to area sources (bottom-up)
- Conducting local activity level surveys (bottom-up)
- Applying a top-down approach

# Applying
# The Top-Down Approach

- Applying source test or national (or regional) derived emission factor to the local level

- Allocating national, regional, or state level emission estimates to the local level

# Calculation 6 and 7

# Applying Source Test

- Devise an emission factor that is based on a surrogate measure for activity level (e.g. population)
- Five basic inputs to the estimation algorithm
  - Activity level or a representative surrogate
  - Emission factor (controlled or uncontrolled)
  - Rule effectiveness factor
  - Rule penetration factor
  - Capture and control efficiencies of any control device when using an uncontrolled emission factor

# Allocating Emission Estimates

- Can use representative surrogate factors- uses surveys of representative subsets of the source category and then scales subset to entire inventory area

- Disadvantage - accuracy lost in the allocation process

# What Is Rule Penetration?

The percentage of an area source category that is covered by an applicable regulation.

$$\text{Rule Penetration} = \left[ \frac{\text{Uncontrolled emissions covered by the regulation}}{\text{Total uncontrolled emissions}} \right]$$

# Example of RE/RP Calculation

- Assumption Operating Parameters Stage I Gasoline Marketing
  - Total county throughput: 500,000 gal/day
  - Tank filling method: splash filling
  - Filling method central efficiency: 95%
  - State I gasoline marketing emission factors: 11.5 lb/1,000 ga throughput (from AP-42, Table 5.2-7)
  - RE is assumed to be 80%
  - RP is assumed to be 93% (fraction of throughput that will be subject to control)

# Example of RE/RP Calculation

$E = ACT \times EF \times 1 - (CE \times RE \times RP)$

$E = 500 \times 11.5 \times 1 - ((0.95)(0.8)(0.93))$

$= 1{,}685$ lb of VOC/day

# Calculation 8

# How Do I Make Temporal Adjustments?

- Collect emission rate and activity data
  - Collect activity data for each specific time period represented by the inventory
  - Conduct a survey to collect area source information (include seasonal emission rate variations)
  - Collect information from indirect sources such as business and labor statistics

# What is Spatial Allocation?

- The adjustment of activity levels or emission estimates to a smaller or larger geographic area than the area for which the activity levels or emission estimates were prepared.

# How Do I Make Spatial Adjustments?

- Make adjustments based on:
  - Local activity level data
  - State or national data
  - Population data
  - Employment data

# Special Issues to Resolve

- Double counting between point source data and emission estimates using are source methods
- Overlap between two area source categories
- Spatial allocation of emissions

# Calculations 10-11

# Example: Architectural Surface Coatings

- Three methods for the source category:
  - Preferred: Survey of suppliers or manufacturers
  - Alternative 1: National average per-gallon emission factors
  - Alternative 2: State or local regulatory per-gallon emission limits

# Example: Architectural Surface Coatings
(Continued)

- Survey of suppliers or manufacturers
  - Planning
  - Preparation
  - Sample questionnaire
  - Survey distribution
  - Compilation and scaling
  - Emission estimation

# Example: Architectural Surface Coatings
(Continued)

- National average per-gallon emission factors
  - Per-gallon emission factor from EIIP, July 1997
  - Method develops per-capita emission factors for the inventory year
  - HAP speciation profile for water- and solvent-based paints

# Example: Architectural Surface Coatings
(Continued)

- Information needed:
  - Census Bureau data on architectural surface coatings shipments for inventory year
  - National population for inventory year
  - Inventory area population for inventory year

# Example: Architectural Surface Coatings
(Continued)

Developing the national average emission factor:

- Total the gallons of all solvent-based architectural paints reported in U.S. Census Bureau Data
- Total the gallons of all water-based architectural paints reported in U.S. Census Bureau Data

# Example: Architectural Surface Coatings

(Continued)

The per capita usage factor is calculated by dividing the total usage of solvent-based paints by the U.S. population, and the total usage of water-based paint by the U.S. population.

For Solvent-Based Paints:

$$\text{Per Capita Solvent - Based Usage Factor} = \frac{\text{Total Solvent – Based Paints (gal)}}{\text{Population}}$$

For Water-Based Paints:

$$\text{Per Capita Water - Based Usage Factor} = \frac{\text{Total Water – Based Paints (gal)}}{\text{Population}}$$

# Example: Architectural Surface Coatings
(Continued)

- Issues specific to architectural surface coatings
  - Controls and rule effectiveness
  - Spatial apportioning
  - Temporal adjustments
  - QA/QC and uncertainty

# Mobile Sources

# Mobile Source Categories

- **Nonroad**
  - **2,4-stroke engines**
  - **Aircraft**
  - **Locomotives**
  - **Commercial marine vessels**
- **Onroad**
  - **Gasoline**
  - **Diesel**

# NONROAD EMISSION INVENTORIES

# Nonroad Source Definition

- Mobile and Portable
- Internal Combustion Powered
- Not Generally Licensed or Certified for Highway Use.
- Examples - agricultural, construction, lawn and garden, industrial/commercial (e.g, airport service vehicles), recreation

# NONROAD MODEL

(2-stroke, 4-stroke and Diesel Engines)

# EPA's NONROAD Model

- Estimates Emissions from
  - 2-Stroke Gasoline Engines
  - 4-Stroke Gasoline Engines
  - Diesel Engines
- Includes Default Data

# 2- & 4- Stroke Engines

Fuels

- Baseline gasoline, conventional lead-free
- Reformulated fuels with MTBE or TAME
- Reformulated fuels with ethanol
- Winter oxygenated gasoline with MTBE or TAME
- Winter oxygenated gasoline with ethanol
- Diesel fuel

# Nonroad Model

- Model covers more than 80 types of nonroad engine categories
- Estimates mass emissions of HC, CO, $NO_x$, $SO_x$, PM10 and PM2.5, and $CO_2$
- Can report emissions down to county level (sub-county with user-supplied data)

# NONROAD Model General Equation

Emissions = Equipment Population x
Average Load Factor x
Activity in Hours/Year x
Emission Factor (with Deterioration and/or New Standards) X
Rated Horsepower

# Model Inputs

(Defaults Provided if Unknown)

- Emission factors
- Base year equipment populations
- Growth factor indicators
- Geographic allocation indicators
- Temporal allocation factors
- RVP
- Temperature
- % Fuel Sulphur
- % oxygen in fuel by weight
- % Stage II Controls
- Emission deterioration factors
- Activity, load factors, and median engine life
- Scrappage function

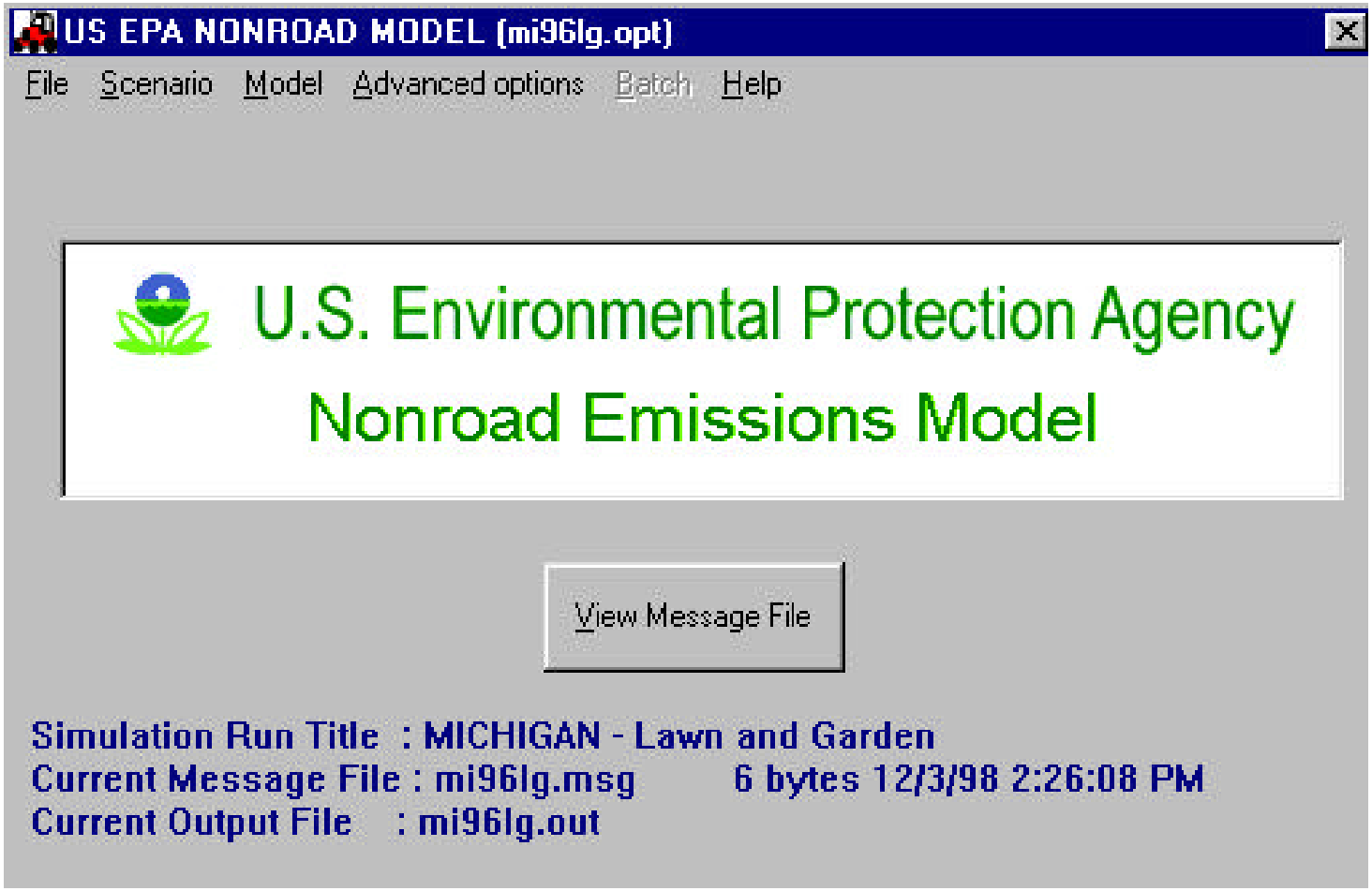
# Where to Obtain Model Inputs

- Sales records for equipment
- Employment records
- RVP from gasoline sales records
- Temperature from the local weather service
- Equipment-related inputs already in the model

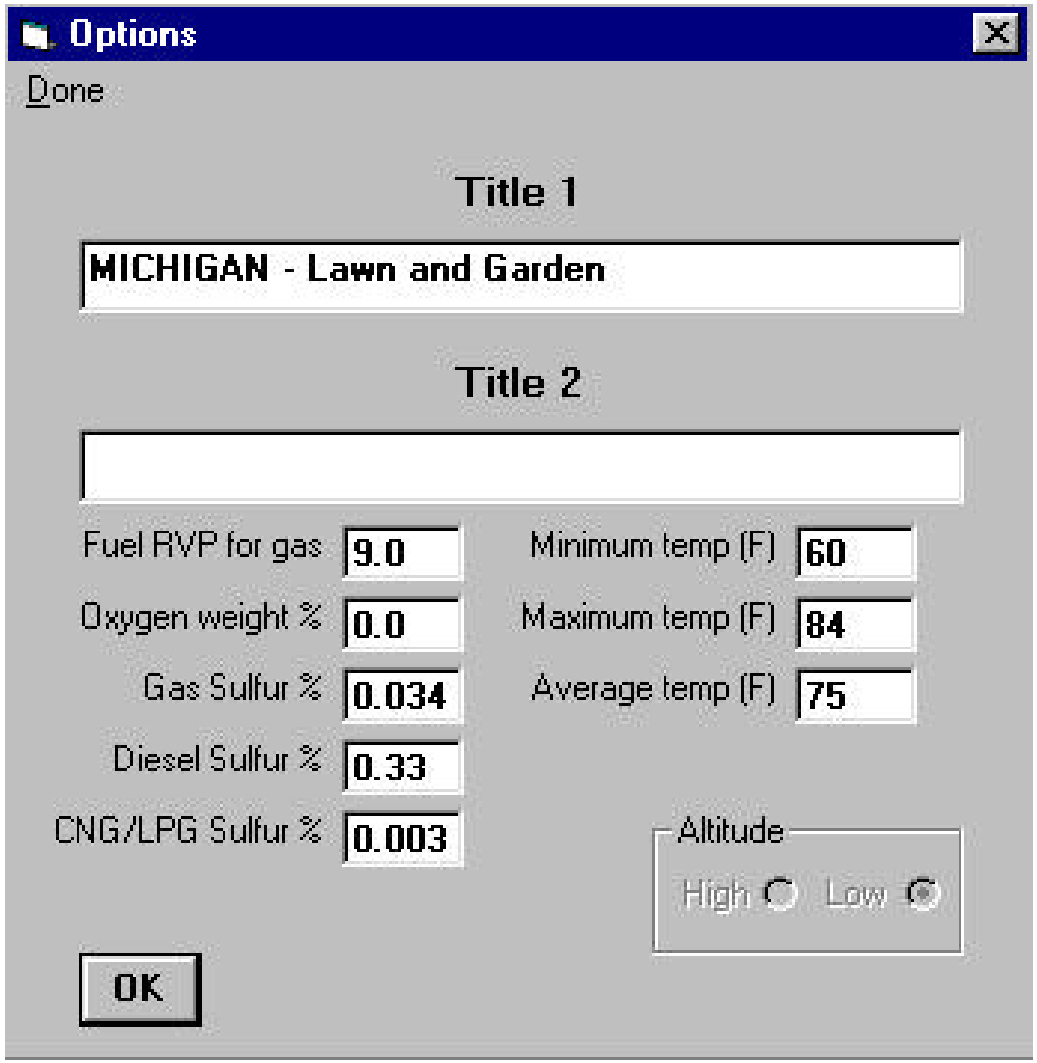
# Equipment Types Covered

- Airport ground support
- Agricultural
- Construction
- Industrial
- Commercial
- Recreational vehicles
- Logging
- Residential/ commercial lawn and garden
- Recreational marine vessels
- Oil field
- Underground mining
- Railway Maintenance

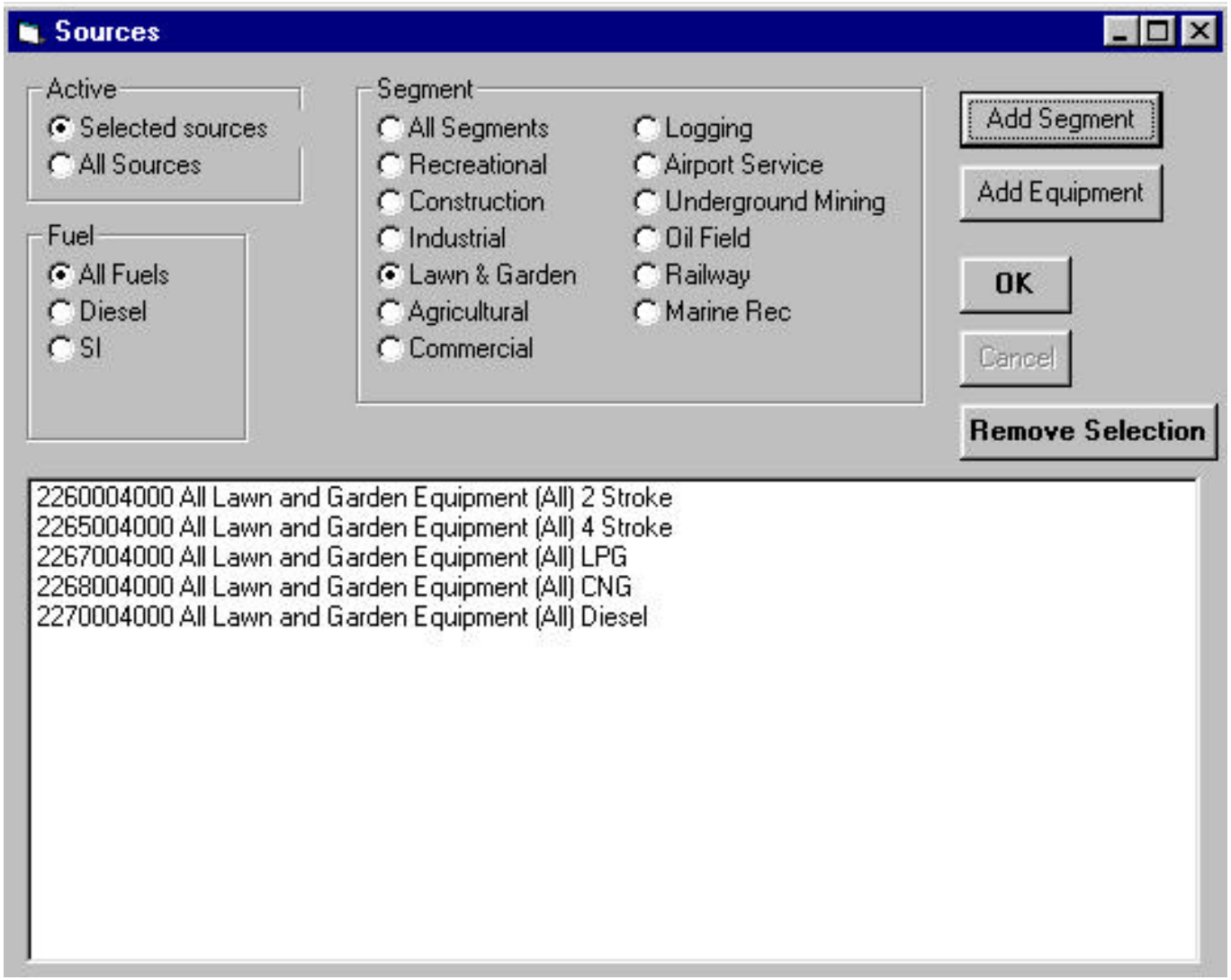
# Introductory Screen



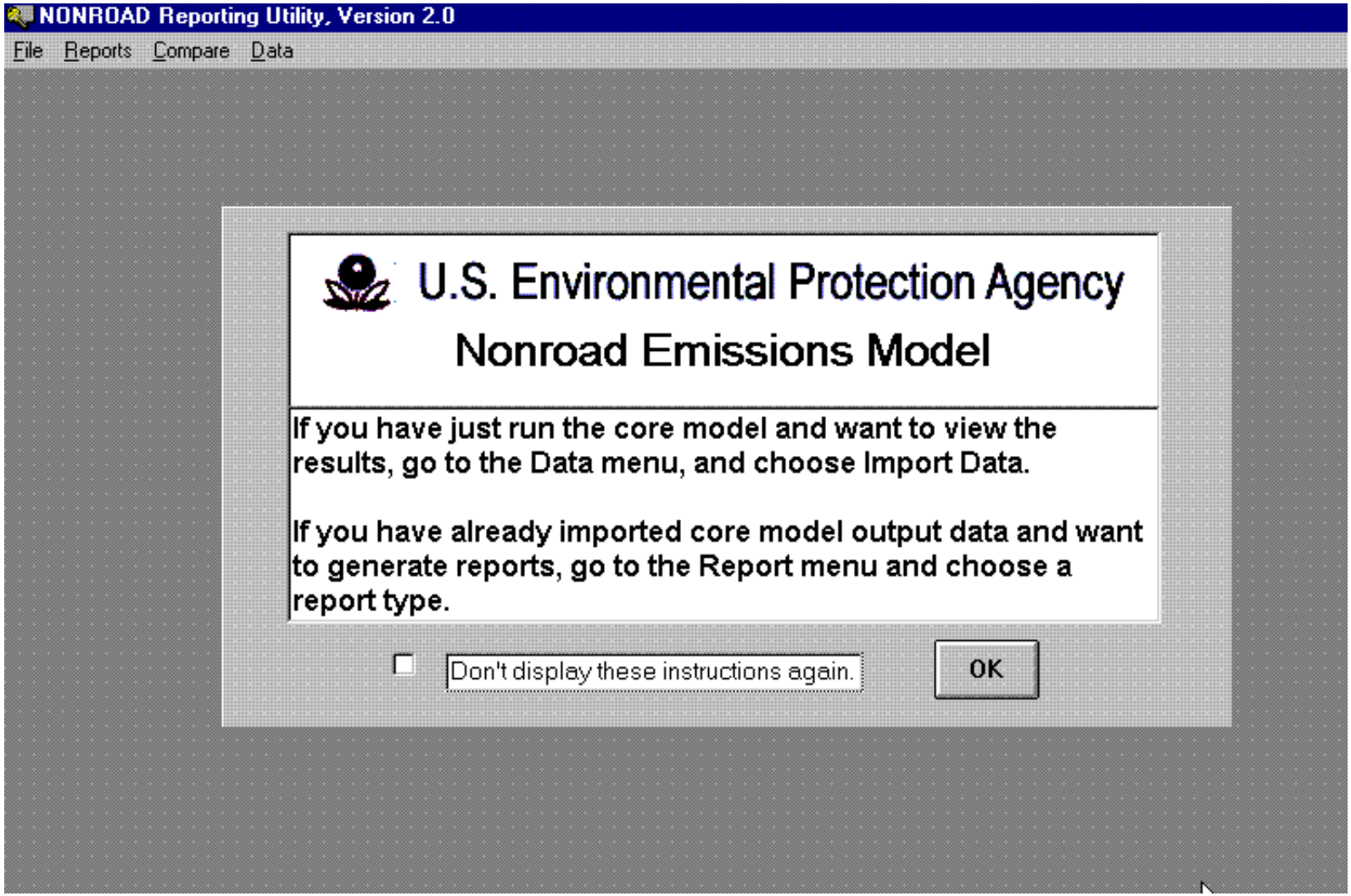
# Options Screen



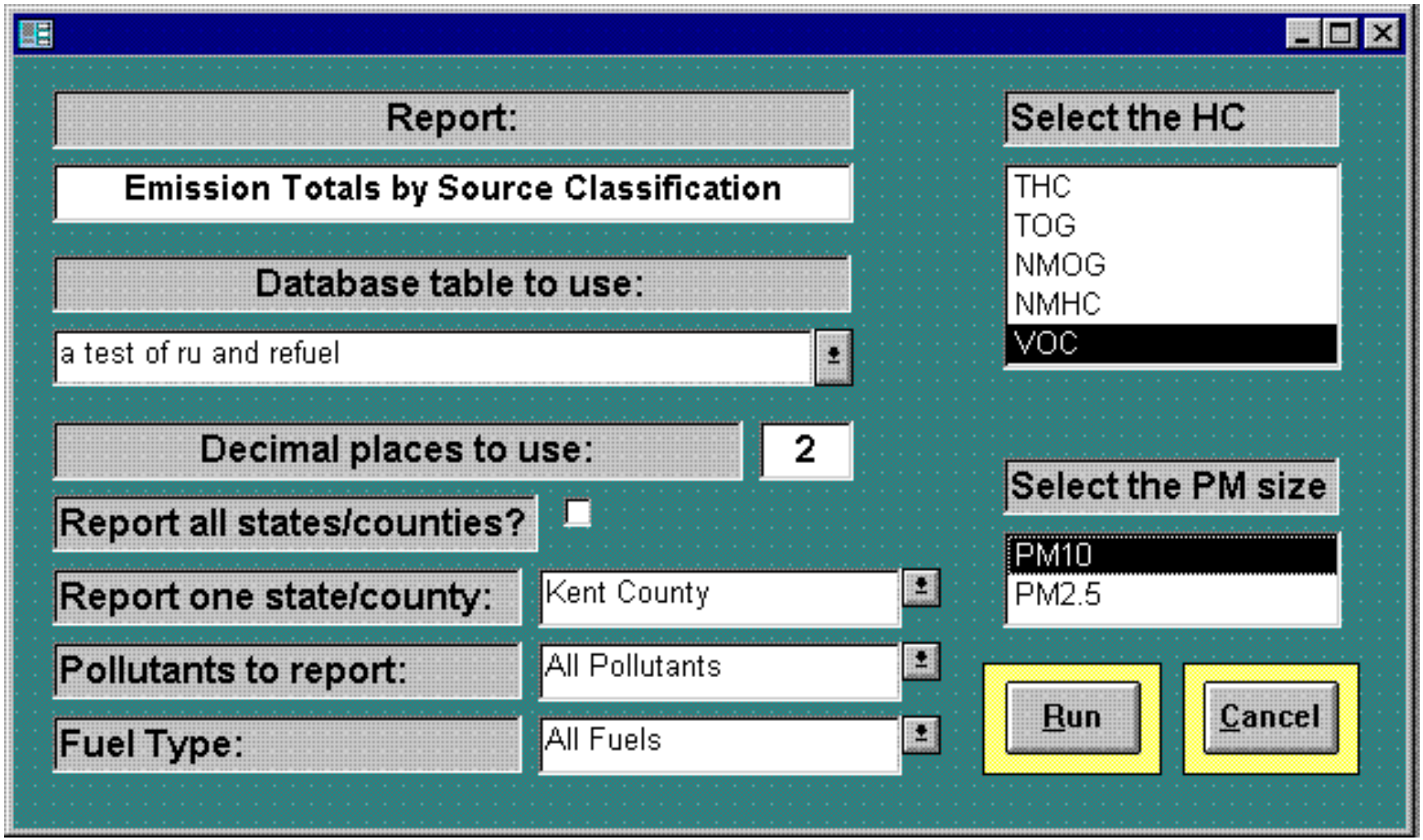
# Sources Screen



# Reporting Introduction Screen



# Sample Reporting Input Screen



# Estimating Aircraft Emissions

- Aircraft fleet mix obtained from your local airport authority

- Emissions model obtained through FAA:

http://www.aee.faa.gov/aee-100/aee-120/edms/banner.htm

# Aircraft

- Types
  - Commercial - jet
  - Air taxis - jet and prop
  - General aviation - prop
  - Military

# Estimating Locomotive Emissions

- Estimate Fuel Use
  - Contact Local Railroads
  - Contact State DOT
- Emission Factor Information

  http://www.epa.gov/oms/regs/nonroad/locmotv/frm/42097051.htm
- OMS Locomtive Emissions Page

  http://www.epa.gov/OMSWWW/locomotv.htm

# Commercial Marine Vessels

- For more information see OMS Marine Engine Emissions website

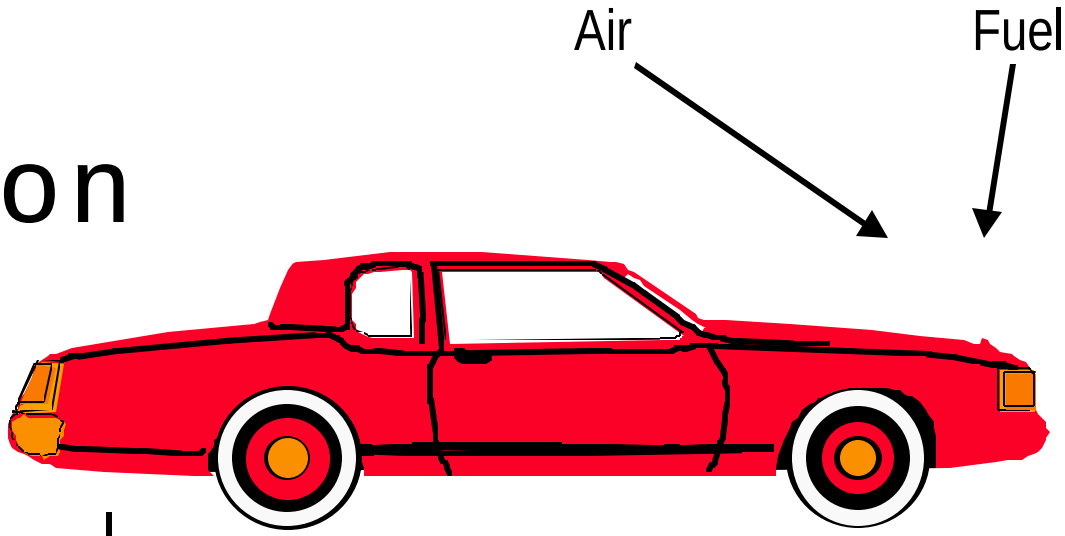
http://www.epa.gov/oms/marine.htm

# Commercial Marine Vessels

- All boats and ships used either for commerce or military activity; usually > 100 ft in length
- Types
  - diesel engines - distillate fuel oil
  - steam turbines - residual fuel oil

# Onroad Mobile Emission Inventories

# The Combustion Process




Exhaust:

- Nitrogen
- Water (steam)
- Carbon Dioxide
- Pollutants

Pollutants:

Unburned Hydrocarbons

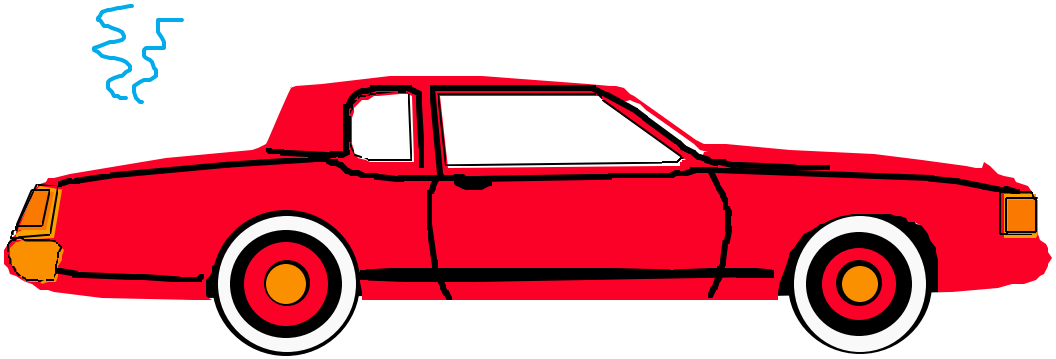
Carbon Monoxide

Oxides of Nitrogen

Other elements or compounds

# Other Emissions from Motor Vehicles

- Evaporative Emissions
  (diurnal, running losses, hot soak)
- Refueling Losses
  (displaced vapors)



- Miscellaneous Emissions
  (due to other evaporation and wear of brakes, tires, etc.)
- Crankcase Losses
  (due to "blowby")

# Onroad Emissions

- Simple Equation
  - Emissions = Activity x Emission Factor
- Activity Data
  - Vehicle Miles Traveled (VMT)
- Emission Factors
  - Ozone precursors
  - PM and SO2
  - Air Toxics

# Onroad Mobile

Vehicle population

- Light duty gasoline-powered vehicles (LDGV)
- Light duty gasoline-powered trucks, < 6000 lb (LDGT1)
- Light duty gasoline-powered trucks, 6000 - 8500 lb (LDGT2)
- Heavy duty gasoline-powered vehicles (HDGV)
- Motorcycles (MC)
- Light duty diesel-powered vehicles (LDDV)
- Light duty diesel-powered trucks (LDDT)
- Heavy duty diesel-powered vehicles (HDDV)

# Onroad Mobile

Fuels

- Baseline gasoline, conventional lead-free
- Reformulated fuels with MTBE or TAME
- Reformulated fuels with ethanol
- Winter oxygenated gasoline with MTBE or TAME
- Winter oxygenated gasoline with ethanol
- Diesel fuel

# Vehicle Miles Traveled

- Needs
  - County level
  - Vehicle type
    - different emission rates
    - 8 types in MOBILE model
    - 12 types in PART5
  - Functional road class
    - important in determining speed
    - 12 functional road classes

# Vehicle Miles Traveled

- Data Sources
  - State Department of Transportation
  - Federal Highway Administration
    - Highway Performance Monitoring System (HPMS)
  - EPA's National Emission Trends (NET) Inventory
- Data Format
  - EPA AMS SCCs
  - Single code contains information on vehicle type and road class

# Onroad Mobile Sources

## MOBILE Emission Factor Models

- Released by EPA's Office of Mobile Sources (OMS)
- Ozone precursors- MOBILE5a and MOBILE 5b currently available, MOBILE6 under development
- PM - PART5 Model
- HAPs - MOBTOX5b

# Emission Factors - Ozone Precursors

- EPA's MOBILE model
  - Developed and maintained by EPA's Office of Mobile Sources
  - Current version is MOBILE5b
  - Model and documentation available at http://www.epa.gov/oms/m5.htm
  - MOBILE6 under development

# MOBILE Model Overview

- Estimates emission factors for VOC, $NO_x$, and CO
- Emission factors in grams/VMT
- Separate emission factors for 8 vehicle types
- Estimates emission factors for years 1970 through 2020

# Mobile Model Important Inputs

- Vehicle Speed
- Ambient Temperature
- Gasoline Volatility (RVP)
- Control Programs
  - Inspection/Maintenance
  - Reformulated gasoline
  - Oxygenated Fuels
  - New Vehicle Standards
- Registration Distributions

# Calculating VOC Emissions

- MOBILE model provides three options for VOC emission factor outputs:
  1. one emission factor for the sum of all VOC components in grams per mile
  2. sum and component (exhaust, evaporative, refueling, running loss, and resting loss) emission factors in grams per mile
  3. sum and component emission factors plus detailed evaporative emission factor breakdown

# Calculating VOC Emissions
(Continued)

- Use detailed evaporative breakdown to get VOC refueling emission factor in grams per gallon--can then report refueling emissions as stationary area source category

# Refueling Emissions

- MOBILE5a/5b can model the following controls:
  - “Stage II” (at the pump)
  - “on-board” (in the vehicle)
- “Stage II” controls required in certain ozone nonattainment areas addressed in the model
- On-board systems:  EPA rule requires phase in for passenger cars beginning in 1998 model year and for light trucks beginning in 2001 model year

# Emission Factors - PM and $SO_2$

- EPA's PART5 model
  - Developed and maintained by EPA's Office of Mobile Sources
  - Model and documentation available at http://www.epa.gov/oms/part5.htm

# PART5 Model Overview

- Estimates emission factors for exhaust PM (1-10 um), $SO_2$ , PM tire and break wear, and paved/unpaved road dust*
- Emission factors in grams/VMT
- Separate emission factors for 12 vehicle types (split out HDDV into 5 categories)

* not recommended for estimation of paved and unpaved road dust

# PART5 Model - Important Inputs

- Control Programs
  - Inspection/Maintenance
  - Reformulated gasoline
- Registration Distributions

# Paved and Unpaved Road Dust

- Consult AP-42 Sections for latest methodology
- Paved Roads section available at

  http://www.epa.gov/ttn/chief/ap42pdf/c13s02-1.pdf
- Unpaved Roads section available at

  http://www.epa.gov/ttn/chief/ap42pdf/c13s02-2.pdf

# EPA OMS Information

- Web site:
  http://www.epa.gov/oms/nonrdmdl.htm
- MOBILE List Server
- E-mail:  nonroad@epa.gov

# Toxics

# End Uses for Emission Inventories

- To meet CAA mandates
- Tracking progress towards National Ambient Air Quality Standards (NAAQS)
- Determine compliance with emission regs
- Identify sources and general emission levels
- Modeling
- Human health assessment
- Impact assessments
- Construction and operating permits
- Trading programs
- Siting ambient air monitors
- Regional/Interregional issues

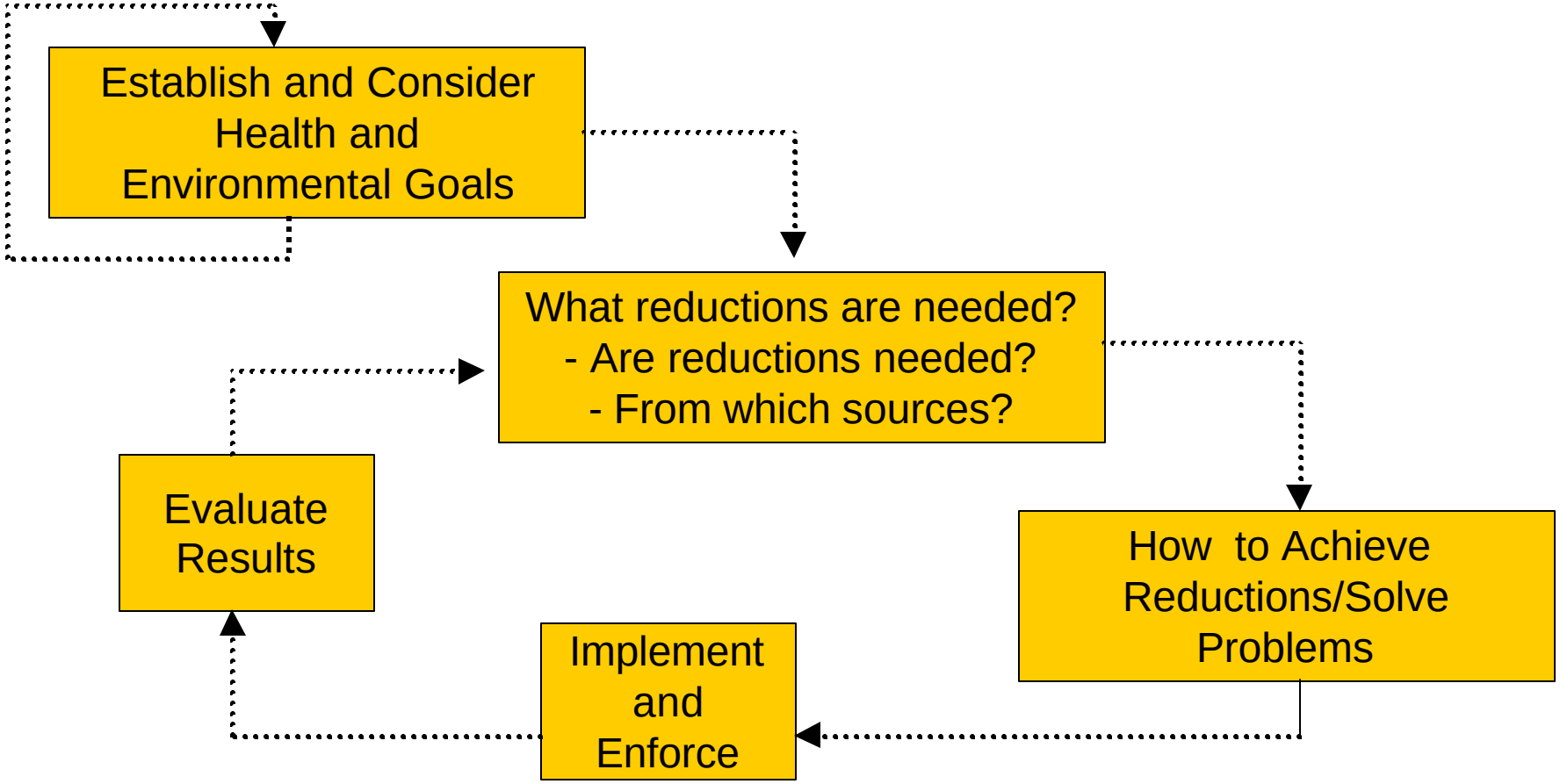
# Uses for Toxics Data

- GPRA Reporting
  - HAP Emission Trends
  - MACT Tracking
  - NATA - National Air Toxics Assessment
- PBT Initiatives
- Hot Sport Identification
- Environmental Justice Screening
- CAA requirements

# CAA Requirements for Air Toxic Inventories

- Sections 112(b & d), MACT
  - Source category & HAP listing/delisting
- Section 112(k), Urban Area Source Program
- Section 112(c)(6)
- Section 112(f), Residual Risk Program
- Section 112(m), Great Waters Program
- Section 112(n), Special Studies, e.g., Hg

# Air Toxics Management Model



# Government Performance & Results Act (GPRA)

Near-term toxics goal (by 2010): 75% emission reductions from 1993 levels

Long term goal: By 20xx, the risk of cancer or other significant health problems from exposure to air toxic emissions will be negligible for at least 95% of Americans, and there will be no serious and adverse effects on our natural environment from air toxic emissions.

# GPRA Methods:

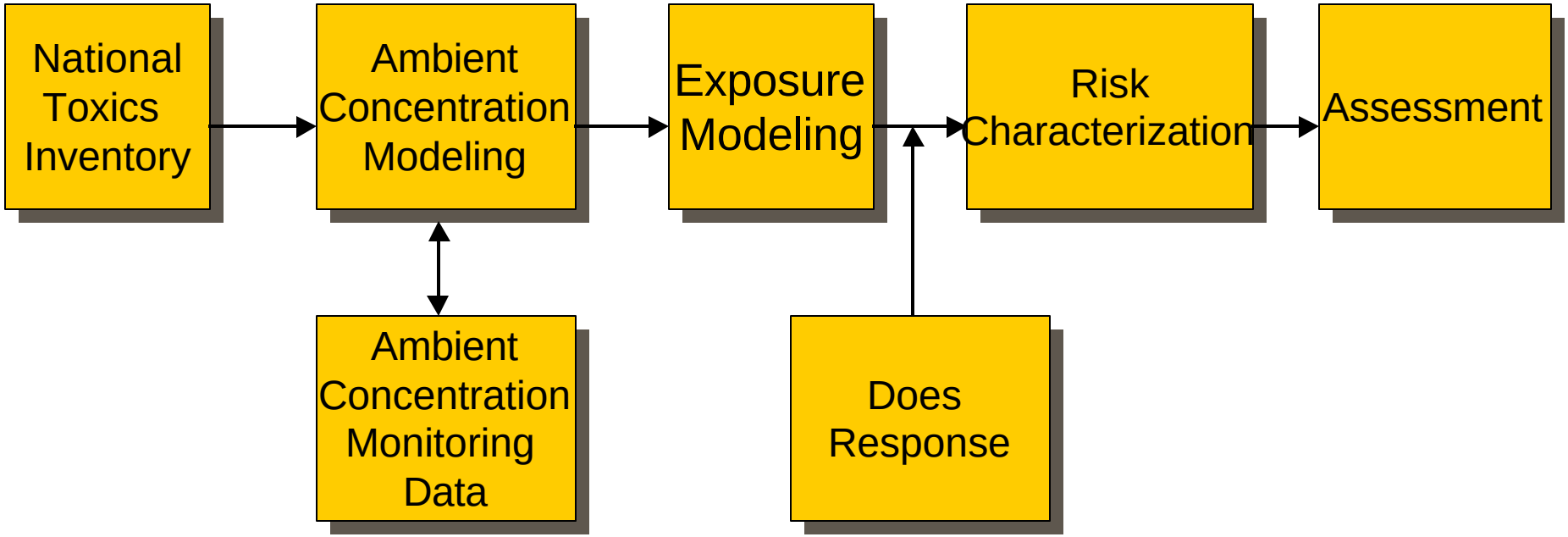
- Near-term toxics measure:

  Annual estimates of HAP emissions and reductions based on NTI.

- Long- term toxics measure:

  NATA- modeling using NTI emissions estimates to predict national exposure of population to HAPs

# National Air Toxics Assessment (NATA)



# Identifying HAPs

- Use CAS #s.
  - Www.chemfinder.com
- Examples:
  - 188 CAA HAPs
  - Urban List of 33 HAPs
  - PBTs
  - HAP List based on toxicity
  - HAPs of interest to state and local programs

# HAP Definition

- See Q&As for 1999 NTI
- Need to clearly define the following HAPs and provide speciated data:
  - POM
  - Dioxin/Furans
  - Metals and Cyanide groups
  - Glycol ethers
  - Xylenes and Cresols

# HAP Definition (continued)

- 7-PAH:
  - Benz(a)anthracene
  - Benzo(a)pyrene
  - Benzo(b)fluoranthene
  - Benzo(k)fluoranthene
  - Chrysene
  - Dibenz(a,h)anthracene
  - Indeno(1,2,3-cd)pyrene

16-PAH (includes 7-PAH HAPs)

- Acenaphthene
- Acenaphthylene
- Anthracene
- Benzo(ghi)perylene
- Fluoranthene
- Fluorene
- Naphthalene
- Phenanthrene
- Pyrene

# Major Source Thresholds

- Any stationary source with the potential to emit, considering controls, over a set threshold of the regulated pollutant.
  - For HAP sources, a major source is one emitting 10 tpy of any one HAP, or 25 tpy or more of any combination of HAPs.
  - For criteria pollutants, definition depends on area attainment designation and the pollutant.
    - e.g., In a serious nonattainment area, a major source of VOC is a source with the potential to emit at least 50 tpy VOC.

# HAP Area Source Thresholds

- Any stationary source with the potential to emit, considering controls, over a set threshold of the regulated pollutant.
  - For HAP sources, an area source is one emitting less than 10 tpy of any one HAP, or 25 tpy or more of any combination of HAPs.

# HAPS - Consider Urban vs. Rural Areas

- Use 112k Strategy Definition of Urban and Rural

- All counties in US are classified as Urban or Rural in the 112k Strategy

# Where Do I Find Existing HAP Emission Data

- The National Toxics Inventory(NTI)
  - ftp://www.epa.gov/pub/EmisInventory/nti_96/
- CHIEF Web - summary 1996 NTI data
- 112k and 112c6 inventories
- S/L/T inventories
- MACT data
- TRI data

# How Should I Research Possible Sources of HAPs?

- Identify sources of HAPS
  - 1996 NTI
  - MACT data
  - Existing S/L/T inventories
  - TRI data
  - Permit files
  - Risk assessments
  - Source test data, compliance data
  - EPA documents/tools, e.g. EIIP, L&Es, AP-42

# Key Steps in Preparing HAP Inventories

- Special Issues
  - Categories to include as point sources
  - HAP emission thresholds to include as point sources
  - HAP synonyms
  - MACT implementation
  - HAP control devices in place

# Resolution of HAP Data - Examples

- Facility data only
- Emission unit without process level
- Unit-level Emissions with known processes, but without process level emissions

# Resolution of HAP Data - Examples

- Process level emissions without emission unit information

- Process-level emissions associated with single emission unit or multiple emission units

# 2- & 4- Stroke Engines

## HAPS

acetaldehyde
acrolein
benzene
1,3-butadiene
chromium
ethylbenzene
formaldehyde
lead
manganese
mercury
MTBE
n-hexane
nickel
POM, 7-PAH and 16-PAH
propionaldehyde
styrene
toluene
xylenes

# 2- & 4- Stroke Engines

## HAP Emission Estimation

1. Obtain TOG from NONROAD model.
2. Obtain VOC and PM estimates from criteria inventory.
3. Disaggregate TOG and VOC emissions into diesel- and gasoline-powered 2- and 4-stroke engine types using NONROAD model.
4. Disaggregate TOG and VOC emissions into exhaust and evaporative emissions using NONROAD model.
5. Disaggregate exhaust and evaporative emissions by fuel types used in base year

   (Allocation was based on base year market share of different fuels.)
6. Speciate TOG, VOC and PM estimates.

## Allocation: based on population

# 2- and 4- Stroke Engines

- HAP Inventory Tools for Nonroad Engines
  - EPA NONROAD Model

    www.epa.gov/oms/nonrdmdl.htm
  - Nonroad Engine and Vehicle Emission Study (NEVES)
  - EPA large compression-ignition engine rule
  - EPA small spark-ignited engine rule
  - 1996 NTI documentation

# Aircraft

HAPS

acetaldehyde
acrolein
benzene
1,3-butadiene
ethylbenzene
formaldehyde
lead
n-hexane
POM, 7-PAH and 16-PAH
propionaldehyde
styrene
toluene
xylenes

# Aircraft

- HAP Emissions estimation

1. Estimate national VOC and PM emissions by applying LTO emission estimates to # of LTOs associated with four aircraft types
2. Apply OMS speciation profiles to develop HAP estimates

- Allocation

  Allocate national emissions to counties using county proportion of national air carrier activity derived from FAA database of 600 U.S. public airports. This database only includes commercial air carriers.

# Aircraft

- HAP References

  Federal Aviation Administration Engine Emission Database (FAEED)

  1996 NTI documentation

# Locomotives

- Locomotives - powered by diesel electric engines.
- HAPs

| | | |
|---|---|---|
| acrolein | manganese | styrene |
| arsenic | n-hexane | toluene |
| chromium | nickel | xylenes |
| ethylbenzene | propionaldehyde | |

# Locomotives

- HAP Emission Estimation
  1. Obtain state level distillate fuel oil sales for locomotives from DOE or state data
  2. Calculate VOC and PM10 emissions
  3. Speciate VOC and PM10 estimates using OMS HDDV profiles
- Allocation

  Allocate from state level to county

# Locomotives

- HAP References
  - Procedures for Emission Inventory Preparation -- Volume IV
  - Locomotive Emission Standards, Regulatory Support document, OMS, April 1997
  - 1996 NTI documentation

# Commercial Marine Vessels

## HAPs

acetaldehyde
acrolein
arsenic
benzene
beryllium
cadmium
chromium
ethylbenzene
formaldehyde
lead
manganese
mercury
n-hexane
nickel
POM, 7-PAH and 16-PAH
propionaldehyde
selenium
styrene
toluene
xylenes

# Commercial Marine Vessels

## HAP Emission Estimation

1. Obtain individual port activity
2. Calculate amount of fuel oil burned for port
3. Obtain % of fuel oil burned in port from EIIP Volume IV
4. Calculate total fuel oil used in port
5. For distillate oil, calculate VOC and PM 10 emissions and speciate OMS profiles
6. For residual fuel oil, use HAP emission factors developed for steam turbines.

# Commercial Marine Vessels

## HAP References

- Procedures for Emission Inventory Preparation -- Volume IV
- Draft Regulatory impact analysis:  control of emissions from Compression Ignition Marine Engines.  OMS, November 1998.
- Waterborne commerce of the United states, Calendar Year 19xx, Part 5- Waterways and Harbors National Summaries, US Army Corps of Engineers
- Fuel Oil and Kerosene Sales, DOE
- Evaluation of Factors that Affect Diesel Exhaust Toxicity, Truex and Norbeck, 1998
- 1996 NTI documentation

# Onroad Mobile

- HAPS

acetaldehyde
acrolein
arsenic
benzene
1,3-butadiene
chromium
dioxins/furans (TEQ)
ethylbenzene
formaldehyde
lead
manganese
mercury
MTBE
nickel
POM, 7-PAH and 16-PAH
propionaldehyde
styrene
toluene
xylenes
n-hexane

# Onroad Mobile Estimates

2 HAP Emission Estimation Methodologies

- Use emission factors and VMT data

  butadiene, acetaldehyde, benzene, dioxoins/furans(TEQ), formaldehyde,POM

- VOC or PM emissions and speciation profiles

  remainder of mobile HAPs

# Onroad Vehicle Emissions

## HAP Emission Factor Methodology

- Emissions factors (grams/VMT) from MOBTOX5b

  Vehicle miles traveled (VMT)

  Emissions = emission factor x VMT

Ref.: Estimation of Motor Vehicle Toxic Emissions and Exposure in Selected Urban Areas, EPA 1999, www.epa.gov/oms/toxics.html

# Emission Factors - Air Toxics

- EPA's MOBTOX5b Model
  - Estimates in-use toxic emission factors by applying adjustment factors to MOBILE TOG emission factors
  - Model is unofficial and evolving
  - estimates benzene exhaust and evaporative emissions, MTBE exhaust and evaporative emissions, 1,3- butadiene, formaldehyde, and acetaldehyde.
  - Model is not publicly available at this time, but can be obtained on request from Rich Cook, OMS (cook.rich@epa.gov)

# Onroad Vehicle Emissions

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  Vehicle miles traveled (VMT)

  Emissions = emission factor x VMT

Ref.: Estimation of Motor Vehicle Toxic Emissions and Exposure in Selected Urban Areas, EPA 1999, ww.epa.gov/oms/toxics.html

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# Paved and Unpaved Road Dust

- Consult AP-42 Sections for latest methodology
- Paved Roads section available at

  http://www.epa.gov/ttn/chief/ap42pdf/c13s02-1.pdf
- Unpaved Roads section available at

  http://www.epa.gov/ttn/chief/ap42pdf/c13s02-2.pdf

# EPA Office of Transporation and Air Quality (OTAQ)

- Web site: http://www.epa.gov/oms/nonrdmdl.htm
- MOBILE List Server
- E-mail: nonroad@epa.gov